

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of

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for

APPARATUS FOR CONTROLLING TRAFFIC FLOW ALONG A PATHWAY

Background of the Invention

Field of the Invention

This invention generally relates to devices for blocking the flow of traffic along a traffic pathway and more specifically to gates that control automotive flow at a highway railroad crossing.

Description of Related Art

Efforts are being made to improve safety at railroad gate crossings. The purpose is to prevent collisions between trains and automotive vehicles. Conventional crossing gates comprise two crossing gate assemblies. One gate is positioned on each side of the railroad crossing. When the gate is in a blocking position it blocks only the approach lane or lanes of a highway, not the exit lanes. SO it is possible for a person to cross the tracks with the gates in their blocking positions.

More recently it has been suggested to use four crossing gates. A pair of gates are positioned on each side of the highway. One gate closes the approach lane and the other the exit lane. As a result the gates on the opposite sides of the highway provide a substantially continuous barrier. This approach is effective, but it also is expensive because it requires twice the number of gates with all their structures and costs and twice the maintenance. Further, upgrading existing crossings still require a significant effort in routing utilities either across the highway or beneath the

tracks in order to control the operation of the two additional gates. Consequently many railroad crossings continue to be guarded by two gates that only block the approach lanes.

Other approaches for improving railroad crossing gates have been suggested. One initially obvious and simple approach would appear to be merely extending the length of the crossing gate so it extends completely across a highway in a blocking position. In many situations, however, this is not possible because the position of the gate in an open, or vertical, position may interfere with trees, power lines or other structures proximate the crossing gate location. Moreover, such an elongated gate must be constructed with sufficient strength to withstand environmental and other factors.

It has been proposed to use "extendible" gates. An extendible gate generally has a rotatable arm that swings between open and blocking positions and that carries an extendible member. Some operating mechanism the extends and retracts the member as the rotatable arm moves between blocking and open positions. U. S. Patent No. 441,226 depicts one such extendible gate in which a first section can tilt freely from a vertical, or open, position to a horizontal, or blocking, position and carries a movable section. The operating mechanism comprises a ramp or inclined way frame and a pendulum-like device. The pendulum-like device includes a wheel that rides on the way frame and a weighted rod that

engages the movable section. When the first section tilts to a blocking position, the wheel and rod move down the ramp and extend the arm.

5 In U. S. Patent No. 494,390 the operating mechanism comprises a pulley that connects to a swing arm proximate a base. The pulley has a pinion attached to a fixed segment gear. An endless band connects to an inner end of an extendible arm and wraps around the pulley. As the swinging arm rotates, the pulley rotates relative to the swing arm, and
10 the cable extends or retracts the extendible arm.

U. S. Patent No. 4,666,108 discloses a railroad crossing gate with a first rotatable member that carries a telescoping member. However, the extension merely allows adjustment of the overall length of the crossing gate to be determined at an
15 installation site. The telescoping member does not move relative to the first rotatable member after installation.

U. S. Patent No. 6,212,825 is an example of a gate with a motor driven operating mechanism. The mechanism rotates the secondary gate between extended and retracted positions with
20 respect to a primary gate. The motor drive attaches to the free end of the primary gate.

U. S. Patent No. 6,618,993 and U. S. Patent No. 6,267,332 depict railroad grade crossing systems in which a motor drives an extendible member between extended and retracted positions

for purposes of completely closing vehicle access to a railroad crossing.

5 The foregoing patents disclose operating mechanisms of different implementations. However, they all require increased maintenance. Each operating mechanism is subject to wear and vandalism. The motor-driven railroad crossing gates are more expensive to manufacture and still require further maintenance.

10 In addition, it is estimated that there are many thousands of railroad grade crossings that need to be upgraded allowing a single crossing gate to block both the approach and exit lanes of one side of the grade crossing. It might appear that these operating mechanisms theoretically could be used for such upgrades. However, each of the foregoing operating mechanisms has inherent complexities and costs that will make the use of
15 such operating mechanism unattractive for retrofitting.

Summary

Therefore it is an object of this invention to provide and extendible gate for blocking traffic flow across an entire traffic pathway.

20 Another object of this invention is to provide an extendible gate that is reliable and economical to construct.

Another object of this invention is to provide a railroad crossing gate that blocks traffic at both the approach and exit lanes of a highway.

Yet another object of this invention is to provide a railroad crossing gate that is economical to manufacture.

Still another object of this invention is to provide a railroad crossing gate that is reliable and requires minimal maintenance.

Yet still another object of this invention is to provide a railroad crossing gate that can retrofit to upgrade existing crossing gates.

In accordance with one aspect of this invention a gate attaches to a base unit mounted adjacent a traffic path to block traffic flow along the traffic pathway. The gate has a first hollow member affixed to the base for limited rotation between open and blocking positions. A second member is slidable in the first hollow member for a displacement distance along an extension axis. A stop member internally of the first hollow member defines the limits of the displacement distance. In the open position the second member nests in the first hollow member. In the blocking position the second member extends from the first hollow member to a position determined by the stop member thereby to block a traffic pathway.

In accordance with another aspect of this invention a railroad crossing gate for blocking a highway comprises a base unit and a gate. The base unit mounts in the ground adjacent a highway and has a source of electrical power, a rotatable arm and an electrically-operated motor for rotating the arm between

an open position and a blocking position. The gate includes a hollow member having a first end affixed to the arm whereby the hollow member rotates between the open and blocking positions with the arm. An extendible member is slidable within the hollow member from an inner position to an outer position relative to the hollow member along an extension axis. A stop defines the outer position of the extendible member whereby in the open position the extendible member nests in the hollow member and in the blocking position the extendible member extends from the hollow member to an outer position thereby to block traffic on the highway from the railroad crossing.

Brief Description of the Drawings

The appended claims particularly point out and distinctly claim the subject matter of this invention. The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. 1 depicts a railroad crossing gate constructed in accordance with this invention in an open position;

FIG. 2 depicts the crossing gate of FIG. 1 in a blocking position;

FIG. 3 is a cross-section taken along lines 3-3 in FIG. 2;

FIGS. 4A and 4B depict an end structure useful in connection with the crossing gate of FIGS. 1 and 2;

FIG. 5 is a view of another embodiment of railroad crossing gate in an open position;

5 FIG. 6 depicts the railroad crossing gate shown in FIG. 4 in a blocking position;

FIG. 7 is a cross-section taken along lines 6-6 in FIG. 5; and

10 FIG. 8 is an enlarged portion of a stop member structure as shown in FIG. 5.

Description of Illustrative Embodiments

Referring to FIGS. 1 through 3, a first embodiment of a crossing gate 10 includes a base unit 11 with a base or footing 12 generally buried in the ground. A post 13 extends
15 vertically from the footing 12 and carries a rotatable arm 14 mounted on a pivot 15 with a counterweight 16. An enclosed motor drive 17 moves the arm 14 between an open position shown in FIG. 1 and a closed position shown in FIG. 2. Such base units 11 are well-known in the art and are particularly adapted
20 for being retrofitted by a gate constructed in accordance with this invention.

An arm 15 carries a gate 18 constructed in accordance with this invention. IN FIGS. 1 through 3, the gate 18 includes a first hollow member 20 with a first an end 21 affixed to the

arm 14. A second end 22 typically will be displaced from the first end 21 so the overall length of the first member will be approximately one-half the width of a grade crossing. That is, in the blocking position shown in FIG. 2, the first member 20 essentially blocks an approach lane. As shown in FIG. 3, the first member 20 is formed as a hollow tapered rectilinear structure. Such structures are readily produced by extrusion of a carbon-filled fiberglass or like light-weight, strong, rigid material.

The hollow member 20 carries a number of lights 23 spaced along its exterior in accordance with conventional requirements. The connection of such lights to an electrical power source in the base unit 11 is well-known to those skilled in the art and is not shown in this disclosure.

The hollow member 20 also carries a tapered or inclined ramp 24 having a maximum thickness at the end 21. The inclined ramp carries a plurality of spaced bearings 25 on which an extendible arm 26 can be displaced along an extension axis 27. The extendible arm 26 has an inner end 28 and an outer end 29 and is preferably formed of an extruded aluminum or like material. When the hollow member 20 is in a blocking position, the extension axis 27 inclines downwardly from the arm 14 toward the outer end 29.

The hollow member 20 and extendible arm 26 operate with stop 30 that defines the limit of outward displacement of the

extendible arm 26. As shown specifically in FIGS. 1 and 2, a first stop element 31 attaches to the interior surface of the hollow member 20 and a second stop element 32 attaches to the outer surface of the extendible arm 26.

5 The extendible arm 26 also includes a plurality of embedded lights 33 axially spaced along the length of the extendible arm 26. These would also be connected in parallel with lights 33. Specific connections are not shown because they are well known to persons of ordinary skill in the art.

10 The end 29 of the extendible arm 26 carries an end structure 34 that includes a pivoted leg or lifter 35. When the extendible arm 26 is in the blocking position, the lifter 35 pivots to a position shown in FIG. 2 thereby to provide outboard support for the gate 18 by engaging the ground.

15 FIGS. 1 and 2 also depict an optional heating unit 36 with a thermostat 37 that is useful in colder climates to prevent any buildup of ice within the structure that could block the operation or could inhibit the sliding operation.

20 In FIG. 1 the gate 18 is in an open position such that the extension axis 27 is near vertical. In this orientation, gravity retracts the extendible arm 26 into the hollow member 20. Consequently the overall length corresponds to the overall length of a conventional crossing gate and should not interfere with any surrounding structures.

When the drive 17 unit rotates the arm 14 an gate 18 clockwise to the substantially horizontal position shown in FIG. 2, the extension axis 27 will, as a result of the ramp structure 24, attain a downward and outward slope (i.e., to the right in FIG. 2). When gravity acts on the extendible arm 26 and overcomes any sliding friction between the extendible arm 26 and the hollow member 20, the extendible arm 26 moves to the right as shown in FIG. 2 to close the opposite lane of traffic. As will be apparent, the use of the bearing assemblies 25 minimizes the frictional force so displacement of the extendible arm 26 occurs at a very slight downward orientation of the extension axis 27. The weight of the extendible arm 26 can also be adjusted by a selection of materials or extrusion web thickness to optimize this outward movement under gravity. Also, the extendible arm 26 shifts to the right as shown in FIG. 2 until the stop element 32 engages the stop element 31. As will also be apparent, if adjustments in the overall length of the extended gate 13 are required, it is an easy procedure during installation to position the stop element 32 at an appropriate location along the length of the extendible arm 26. That is to shorten the extension, the stop member 32 could be moved toward the end 29.

After a train passes, the arm 14 rotates the gate 18 to the position shown in FIG. 1. Eventually the extension axis 27 will slope down to the end 21. When a sufficient slope exists,

gravity returns the extendible arm 26 into its nested position within the hollow member 20. Thus in accordance with this invention, all the motion of the extendible arm 26 occurs as a result of gravity acting on the extendible arm 26. Only the structure 24 is added to the hollow member 20, and the structure 24 is relatively maintenance free and, in cold climates, can be assured of operation through a heating system such as represented by the heating coil 36.

FIGS. 4A and 4B more clearly define the operation of the lifter 35 in conjunction with the end structure 34. More specifically the end structure 34 includes a pivot 38 and a stop 39. The lifter 35 includes a leg portion 35A and a saddle 35B that mounts on the pivot 38. When the gate 18 reaches a horizontal position, the lifter 35 moves to a vertical position that is spaced so that the leg 35A is spaced from the stop 39. A slight additional rotation of the extendible arm 26 to the position shown in FIG. 4B causes the leg 35A to abut the stop 39. In this position, however, the leg is an over center-position relative to the extension axis 27 so that in contacting the ground 17 the lifter 35 remains in a stable position. When the gate 18 returns to the open position, the lifter 35 pivots away from the stop 39 to the position shown in FIG. 1

FIGS. 5 through 8 depict an alternative embodiment of this invention and like reference numerals refer to like elements

throughout. As shown particularly in FIGS. 5 and 6, a gate 40 connects to the arm 14 of a base unit 11 that is identical to the base unit 11 in FIG. 1. The gate 40 includes a constant diameter tubular member 41 with one end 42 attached to the arm 14 and the other end 43 constituting a free end. Lights 23 attach to the outside of the tubular member 41. The tubular member 41 also carries a plurality of axially-spaced bearing sets 44. As shown particularly in FIG. 7, in this particular embodiment a bearing set 44 comprises four bearing receptacles 45 angularly spaced about the tubular member 41 each carrying a rotatable bearing 46 on a bearing axis 47 that is perpendicular to an extension axis 27.

An extendible arm 50 also formed as a cylinder has an inner end 51 and an outer end 52. The extendible arm 50 carries embedded lights 33 like those shown in FIGS. 1 and 2. The end 52 supports an end cap 34 and lifter 35 that operate in the same manner as shown with respect to FIGS. 4A and 4B.

The gate 40 also includes a stop 53. Referring particularly to FIG. 8, the stop includes two stop elements. A first stop element 54 is affixed to the tubular member 41. The extendible member 50 carries a second stop element 55. As the extendible arm 50 extends from the tubular member 41, the distance between the elements 54 and 55 closes until they abut. This limits that portion of the extendible arm 50 that cantilevers from the tubular member 40. Typically, however,

the stop element 55 is positioned axially so that the inner portion of the extendible arm 50 is proximate the end 51 spans at least two bearing sets 43 to assure that the extendible arm 50 remains on the extension axis 27.

5 FIG. 6 also depicts a bumper 56 located at the end 42 of the tubular member 41. The bumper 56 absorbs any impact caused when the extendible arm 50 retracts into the hollow member 40.

10 The hollow member 40 can also include a heater 36 and thermostat 37 that would operate in the same manner as that shown with respect to the embodiment of FIGS. 1 through 4.

15 The operation of the gate 40 is basically the same as is the operation of the gate 18 in FIG. 1. FIG. 6 depicts the base unit 11 at a curb portion 60, an intermediate roadway 61 and an opposite curb portion 62. In the vertical or open position gravity retracts the extendible arm 50 into the hollow member 40 with the end 51 against the bumper 56. As in the first embodiment, the overall vertical height of the gate 40 is approximately the same as the gate 18 in FIG. 1; that is, the height of the gate 40 is about one-half the extended length.

20 To move the gate to a blocking position, the drive 17 rotates the arm 14 until the extension axis 27 is slightly depressed or inclined downwardly from the end 51 to the end 52. At some small slope, gravity acting on the extendible arm 50 overcomes any sliding friction, so the extendible arm 50 shifts
25 until stop elements, such as the stop element 55 shown in FIG.

8 abut stop elements, such as the stop element 54. As the gate
40 lowers to a blocking position, the lifter 35 extends to its
over center position and engages the curb 62. Thus in the
extended position, the gate 40 blocks both the approach and
5 exit lanes on one side of the railroad tracks. When the gate
40 opens, the drive 17 rotates the arm 14. As the extension
axis 27 rotates above the horizontal, gravity causes the
extendible arm 50 to slide back toward the end 42 against the
bumper 56 so the gate 40 is in its compact configuration when
10 it is vertical. Consequently retrofitting two existing
railroad crossing gates 10 by substituting either a gate 18 or
a gate 40, upgrades the crossing because each gate fully blocks
the roadway on one side of the tracks.

Thus in accordance with this invention a gate is readily
15 adapted for connection to base units at railroad crossings. In
an open position the gate has about one-half the length of its
length in a blocking position. The gates are readily adapted
for upgrading existing crossings by a simple retrofitting
process. This process involves removing the existing gate and
20 rewiring the gate foot for lights and heating elements, if
needed.

Another advantage of this invention lies in the fact that
different highways have different widths. If a full extension
of either of the extendible arms 26 or 50 is not necessary, it
25 is a simple matter during installation to relocate the stop

element, such as the stop element 32 in FIG. 2 or the stop element 55 in FIG. 8 to control the amount of extension by moving the corresponding stop member toward the end structure 34.

5 As will now be apparent, a railroad crossing gate constructed in accordance with this invention meets the various objectives of this invention. The crossing gate provides full blocking across both approach and exit lanes at a railroad crossing. Extruded parts of various lightweight and strong
10 materials make it possible to construct such a railroad crossing gate with minimal expense. The structure is readily used to replace existing crossing gates that only block an approach lane to a railroad crossing. The operation is reliable because the only moving force is the force of gravity.

15 This invention has been described with some specific materials such as carbon-filled fiber, fiberglass for hollow members and aluminum for the extendible members. Other materials might also be substituted while attaining all of the advantages of this invention. Specific light placements and
20 shapes have been shown. Other light placements and shapes could also be substituted. It will be apparent that many modifications can be made to the disclosed apparatus without departing from the invention. Therefore, it is the intent of the appended claims to cover all such variations and

modifications as come within the true spirit and scope of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is: